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DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

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February 17, 1999

Paula H. Doughty  
Manager, Environmental Compliance  
Kennecott Utah Copper Corporation  
8315 West 3595 South  
P.O. Box 6001  
Magna, Utah 84044-6001

Re: Field Trip for Introductory Environmental Chemistry Class, Kennecott Utah Copper Corporation (KUCC), Bingham Canyon Mine, M/035/002, Salt Lake County, Utah

Dear Ms. Doughty:

This letter is a request for a field trip to KUCC properties at the Bingham Canyon Mine and tailings impoundment to collect soil and water samples as part of an Introductory Environmental Chemistry course proposed to be offered through the Office of Surface Mining (OSM). Attached is an overview of the course which I mentioned to Rich Borden over the phone in January. This overview should be considered preliminary since the dates and locations may be revised pending coordination with operators for the proposed field trip locations.

The course is currently proposed for August 1999; however, if all the arrangements cannot be made in time the course may be rescheduled for the following year. Anticipated enrollment is from 10 to 15 students. The course has an enrollment cap of 15 students due to limited lab resources at Weber State University. For the field session, students would select one of three field trip options (coal mine, KUCC tailings impoundment, or waste dumps) and travel to their respective sites in group vehicles. One KUCC staff member for each of the two field groups would be needed to admit the groups onto KUCC property and escort them to and from a sampling site.

Mr. Robert Davidson of the Coal Regulatory Program is the Division's main coordinator for this course. Mr. Davidson can be reached at (801) 538-5264 for additional information. Please contact me or Mr. Davidson before March 30, 1999 regarding KUCC's participation in this hands-on environmental chemistry course. Thank you for your time and consideration of this request.

Sincerely

Anthony A. Gallegos  
Senior Reclamation Specialist

jb

Attachment: 1/13/99 Course Description

cc: Mary Ann Wright, Associate Director  
Wayne Hedberg, Permit Supervisor, Minerals Regulatory Program  
Robert Davidson, Coal Regulatory Program

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# **INTRODUCTORY ENVIRONMENTAL CHEMISTRY**

revision 1/13/99

## **CLASS OBJECTIVE:**

This course will stress understanding the complete environmental sampling and evaluation process which includes site evaluation, sample collection, sample analyses, data evaluation and data interpretation.

## **COURSE DESCRIPTION:**

This course will cover the basic chemistry of environmental mining issues related to hydrology, soil science, and mine spoils. Chemical equilibrium, solubility, and acid/base, oxidation/reduction, and exchange reactions will be stressed in relation to understanding environmental problems. A team approach will be used to evaluate environmental scenarios at active mining sites. After designing sample collection strategy, field trips will proceed to different mining areas where each team will collect samples and evaluate the mine site with respect to the assigned environmental task. Teams will return to the laboratory and analyze their samples for the necessary parameters to help evaluate the assigned mine site. After data collection, each team will evaluate their data and prepare a synopsis for a class presentation of the environmental evaluation.

This class offers the exciting possibility of combining the classroom theory, laboratory analysis and field experience into one class. The student should leave the class fully understanding the necessary steps involved in environmental sampling, analysis, and data interpretation.

- Date: August 23 thru 27, 1999
- Host: Weber State University  
Utah Division of Oil Gas and Mining
- Location: Campus, Weber State University, Ogden, UT
- Instructors: Dr. Charles Davidson, Professor of Chemistry  
Mr. Robert Davidson, Senior Reclamation Specialist
- Field Trip: Coal Mine - Kemmerer, Wyoming - water chemistry problems associated with pits, groundwater, or mine water discharges.  
  
Hard Rock - Kennecott, Utah - Two possibilities for soils and solids - Existing Tailings impoundment and/or Waste Dumps with engineered topsoils.
- Class prerequisite: Freshman chemistry

Costs: To be determined by OSM

### **Day One--Basic Tools (Lecture and Classroom Demonstrations)**

1. Introduction to Environmental Science
2. The Environment: Integration of Four Spheres
  - atmosphere
  - hydrosphere
  - lithosphere
  - biosphere
3. Essential Chemistry Concepts
  - types of reactions
    - precipitation
    - acid/base
    - oxidation/reduction
  - equilibrium
    - buffers
    - exchange
    - complexation
  - microbial biochemistry
  - nuclear chemistry
4. Sample Collection/Preparation
5. Analytical Methods
6. Quality Control

### **Day Two--Applied Concepts (Lecture and Laboratory Exercises)**

1. Water Chemistry - Surface and Ground Water
2. Soil Chemistry - Soils, Substitute Soils, Spoils and Mine Wastes
3. Field Trip Preparation

### **Day Three--Field Trips (Water and Solid Teams)**

1. Site evaluation and sample collection (Teams)
2. Samples (Teams)
  - surface and ground waters
  - solid wastes - coal refuse
    - mine development waste

- topsoil, substitute topsoils, and spoils

#### **Day Four--Discovery**

1. Laboratory Analysis (Teams)

- waters - TSS, TDS, pH, EC, cations, anions

Methods and Instrumentation - ICP/mass spec, atomic absorption spectrometry, colorimetry, ion-specific electrodes, gravimetric, conductivity bridge

- soils - saturation paste extract, pH, EC, SAR, saturation z%, available water capacity, boron, selenium

Methods and Instrumentation - ICP/mass spec, atomic absorption spectrometry, colorimetry, gravimetric, conductivity bridge

- solid wastes - acid/base potential, selenium, boron, heavy metals, organic analysis

Methods and Instrumentation - atomic absorption, ICP/mass spec, gas chromatography

#### **Day Five--Evaluation**

1. Data Evaluation/Problem Solving (Team activity)
2. Team Presentations
3. Summary